



## Temporization of endodontically treated teeth

Lieutenant Commander David M. Kenée, DC, USN, Captain Scott B. McClanahan, DC, USN,  
and Captain James D. Johnson, DC, USN

### Introduction

It is essential that clinicians minimize contamination of the root canal system by fluids and bacteria of the oral cavity between endodontic therapy appointments and after the canal system has been obturated. Additionally, remaining tooth structure must be preserved and protected until a permanent coronal restoration can be placed. The purpose of this clinical update is to describe the principles involved in choosing a material that will best accomplish these goals.

### Background

A multitude of materials have been used to seal preparations created for endodontic access. A material should be chosen for temporization that provides the following:

- A marginal seal that prevents leakage from the oral environment
- Protection of tooth structure until the final restoration is placed
- An adequate seal of the temporary material itself
- Dimensional variation that closely approximates tooth structure
- Resistance to dissolution in oral fluids
- Resistance to abrasion and compression
- Ease of insertion and removal
- Retention of any intracanal medicaments placed
- An acceptable esthetic appearance where indicated (1,2,3)

### Specific materials for temporization

Zinc-oxide eugenol (ZOE) is the most common type of material used for temporization and is available as Intermediate Restorative Material (IRM)<sup>®</sup>. IRM was originally developed by the L.D. Caulk Co. for use by military dentists when sealing teeth with deep carious involvement but no pulpal exposure (2). Cavit<sup>®</sup> (ESPE) is used frequently in large part because of its easy, no-mix formulation, and it provides a superior seal. TERM<sup>®</sup> (Temporary Endodontic Restorative Material) (L.D. Caulk), a visible light-cured resin, has been widely used as well (4).

Extensive research has attempted to determine which materials demonstrate superior qualities in all situations. No material has been found to be universally superior. However, some circumstances favor the use of specific materials. It is imperative that the clinician recognize the clinical factors that dictate choosing one material over another.

Cavit is a commercially prepared, premixed, polyvinyl chloride acetate-calcium sulfate cement catalyzed by contact with water or oral fluids. Webber and colleagues found that a thickness of

at least 3.5mm of Cavit is necessary to prevent leakage (5). The most significant advantage of Cavit, when used in adequate thickness and in the presence of water, is that it provides a superior seal to other available materials because of its expansion upon setting (1,5,6,7,8).

IRM is polymer-reinforced (20% polymethyl-methacrylate) zinc oxide powder mixed with IRM liquid (eugenol and 1% acetic acid) in the operatory. IRM has a coefficient of linear expansion only half that of Cavit, but a compressive strength nearly doubling Cavit (9). Thus, while it may leak more due to shrinkage on setting, its increased strength may cause clinicians to favor its use in areas of high occlusal stress (5). Conflicting evidence exists as to whether changes to the powder to liquid ratios affect IRM leakage (10,11).

TERM is a predosed visible light-cured resin. Its advantages include better esthetics than IRM and Cavit and possibly less leakage when insufficient space exists for sealing with Cavit. Anderson et al found that TERM maintained a leakproof seal for as long as 3 months in 60% of the teeth they tested (6). Hansen et al tested 1, 2, 3, and 4mm thicknesses of TERM placed into access preparations. No significant differences were found in leakage amounts between any thickness at 1 and 24 hours, or at 1, 3, and 5 weeks. TERM may be well-suited for temporization when less than 4 mm of space exists (4).

Amalgam is also advocated as a material of choice for sealing the access preparation. Reasons for using amalgam include: 1) when access has been made through a cast restoration (the amalgam thus will be a permanent restoration), 2) when it is anticipated that a permanent restoration might not be placed for an extended length of time, and 3) when very heavy occlusal forces preclude using even IRM. In the case of the latter two, however, it is critical that the patient be informed that the amalgam is not intended to be permanent, and a definitive restoration (cuspal coverage on all posterior teeth) should be placed as soon as possible.

### Comparisons of various materials

Despite a multitude of materials used for temporary filling of endodontic access preparations, only Cavit and IRM have withstood the rigors of testing and evaluation. They have been joined in the last decade by TERM. Many studies over the last 10 years have compared Cavit, IRM and TERM. In almost universal agreement, research has found Cavit to leak significantly less than IRM (1,7,11,12,13). Additionally, a similar finding was reached when TERM was compared to IRM (1,7,12). Mayer and Eickholz found comparable marginal conditions between

TERM and Cavit after thermocycling and mechanical loading (7). Conversely, in a bacterial leakage study, Beach et al showed that Cavit, while not different from IRM, provided a significantly better seal than TERM after three weeks (8).

### Placement of temporary fillings

These materials will provide an adequate seal and strength if used in sufficient thicknesses. It is essential that all materials be placed into an access preparation with parallel, or preferably divergent, walls (12). This is necessary to prevent masticatory forces from causing the temporary filling material to be pushed in an apical direction thus destroying the marginal seal. After the canals have been appropriately filled (with either gutta percha or interappointment intracanal medicaments), a dry cotton pellet should be placed to occlude the canal orifice(s). The cotton pellet need only be thick enough to block movement of the temporary material into the canal and thus simplify access for subsequent endodontic therapy or restorative procedures. Conversely, it must be thin enough to allow for sufficient space between the cotton and the access preparation's cavosurface margin. This space permits placement of an adequate thickness of temporary material. A thickness of *at least* 3 millimeters is required. Proper placement of material involves incremental addition. Initial amounts are placed via a "beaver-tail" or other paddle-shaped instruments (e.g. Glick #1 or Woodson) to cover the base (the cotton pellet). Material is then smeared against one wall and pulled to the cavosurface margin. This technique is then similarly used against the opposite wall. The center is filled last and all material is compressed apically. Gross excess may be removed with the same instrument, although this technique yields only minor excesses. Excess may be wiped away with a moist cotton-tipped applicator, always being careful to pull toward the margins. Complete setting takes approximately one hour, so appropriate post-operative instructions should be given to the patient (14).

### Conclusions

When choosing a temporary filling material, consideration should be given to space available for the material, occlusal forces on the tooth, and length of time until permanent restoration. Accurate placement of the material is essential in order to provide proper marginal sealing. Regardless of the type of material chosen to temporarily fill an endodontic access preparation, an adequate thickness of material is critical to ensure that an acceptable seal is created. Not ensuring this seal jeopardizes even the best 3-dimensional obturation of the root canal system. Because no material has been shown to be superior in all situations, clinicians should consider all factors in any given case, then choose the most suitable material for temporization.

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Dr. Kenée is a resident in the Endodontics Department. Dr. McClanahan is a staff member in the Endodontics Department. Dr. Johnson is the Chairman of the Endodontics Department.

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